National Institute of Environmental Health Sciences

Genetic and phenotypic analysis of Vibrio cholerae non-O1, non-O139 isolated from German and Austrian patients

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Abstract:

Vibrio cholerae belonging to the non-O1, non-O139 serogroups are present in the coastal waters of Germany and in some German and Austrian lakes. These bacteria can cause gastroenteritis and extraintestinal infections, and are transmitted through contaminated food and water. However, non-O1, non-O139 V. cholerae infections are rare in Germany. We studied 18 strains from German and Austrian patients with diarrhea or local infections for their virulence-associated genotype and phenotype to assess their potential for infectivity in anticipation of possible climatic changes that could enhance the transmission of these pathogens. The strains were examined for the presence of genes encoding cholera toxin and toxin-coregulated pilus (TCP), as well as other virulence-associated factors or markers, including hemolysins, repeats-in-toxin (RTX) toxins, Vibrio seventh pandemic islands VSP-1 and VSP-2, and the type III secretion system (TTSS). Phenotypic assays for hemolysin activity, serum resistance, and biofilm formation were also performed. A dendrogram generated by incorporating the results of these analyses revealed genetic differences of the strains correlating with their clinical origin. Non-O1, non-O139 strains from diarrheal patients possessed the TTSS and/or the multifunctional autoprocessing repeats-in-toxin (MARTX) toxin, which were not found in the strains from ear or wound infections. Routine matrix-assisted laser desorption/ionization (MALDI-TOF) mass spectrometry (MS) analysis of all strains provided reliable identification of the species but failed to differentiate between strains or clusters. The results of this study indicate the need for continued surveillance of V. cholerae non-O1, non-O139 in Germany, in view of the predicted increase in the prevalence of Vibrio spp. due to the rise in surface water temperatures.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Food/Water Quality

Food/Water Quality: Pathogen

Geographic Feature:

resource focuses on specific type of geography

Freshwater, Ocean/Coastal

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : Germany; Austria

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Foodborne/Waterborne Disease

Foodborne/Waterborne Disease: Vibrioses

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified